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New era with unstructured search

By Leo van der Reis, MD, Principal, CCI

Two of the important challenges facing the nation are homeland security and affordable health care. While they may not seem related, both issues share the goal of protecting the welfare of U.S. residents and both have a need for:

- Secure connectivity among diverse agencies
- Common code sets for transmitting information
- Rapid availability of data about events and individuals
- Capability to archive information for later study

Advances in unstructured search have implications for relational databases and user interfaces.

Both of these issues are about to be affected by an innovation known as *unstructured search*.

What is *unstructured search*?

Unstructured search can be defined as: *"the tools and methods necessary to store, access and retrieve, navigate, and discover knowledge in primarily text-based information."*¹ Advances in unstructured search have implications for relational databases and user interfaces.

Relational databases

Relational databases are powerful tools that store data in the form of related tables. The appeal of the relational database is that it requires few assumptions about how information is related or how it will be extracted. Therefore, the same database can be viewed in many different ways. An important feature of relational systems is that a single database can be spread across several tables. This differs from flat-file databases, in which each database is self-contained in a single table.

User interfaces

When entering data in conventional applications, the user keys information into a data entry screen from which the information is placed in a table of a relational database. From the table, the data can be stored and accessed for manipulation. This process creates user interfaces that are shaped to fit the underlying database and forces users to adjust to computer idiosyncrasies and adopt machine-compliant behaviors, such as filling in blanks, choosing from lists, and navigating through multiple menus. These interfaces still prevail although they have been mitigated by graphical user interfaces and the mouse. Only about 15 per cent of all data generated in an organization can be captured in this way. Most forms of data collected are unusable for search and manipulation by relational databases.

With unstructured search technology, a new era has arrived that eliminates the need for user interfaces to be data entry screens for relational databases. Since text documents can be searched in many different ways depending on how search



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queries are constructed, a user can communicate on the computer in a natural way without any predefined format. If it is necessary for specific information to be included in documents to be accessed and manipulated after it is stored, then the interface must have important functionality available. The software that provides this and other functionality is "Interface Substructure Software" (ISS). ISS has the ability to customize the computer interface to have the look and feel a user wishes, can build in workflow efficiencies, can make continuous speech recognition seamless for the user and, importantly, assure that specific information is included in text documents created on the interface.

Computer economics

Applications built on relational databases control data throughout the world. Controlling essential data allowed relational database companies to leverage business models in which they can charge users for accessing, storing and using company data on a yearly license basis. Integrating applications to work together, maintaining database systems and consulting fees all add to IT costs. Companies and institutions essentially have lost control of their own data and have paid large license fees in the bargain. A majority of additional data collected in these entities is in formats not searchable in relational databases.

With unstructured search capable of retrieving specific information on demand, even from relational databases, the economic climate for data capture and control has a whole new look. It is now feasible for institutions and companies to store their own data in secure repositories. They can access, search and manage 100 per cent of their data in many different formats. They can utilize their data in new ways and incorporate legacy data into current projects when appropriate. Information technology costs can be significantly reduced.

Healthcare economics

A huge industry has been built up in hospital IT based on the needs of healthcare organizations to share data on a timely basis. Since it is necessary for any application to be connected to other third party software, integration issues, turf wars, and politics always made sharing of information difficult and expensive. Even then, only 15 to 20 percent of relevant data are available to be shared. Healthcare is a slow, very large market where payment is subsidized and inefficiencies and antiquated methods persist. Moving healthcare to a total electronic data management system has been promoted as a necessary, major reform to alleviate the crisis the system faces today.

As much as one third to one half of healthcare IT costs can be eliminated by the adoption of a system incorporating unstructured search, data repositories, and a suitable user input software. If healthcare providers would assert this one basic premise then most of the current logjam and expense in healthcare IT would be gone:

- "Any data we generate in any application in the execution of our work is our own. We own it. Any application we license must place our data in our repository to be accessed by whoever needs it and is authorized to access it."

User interfaces will suit the users, much more data will be searchable and available, and integration will be vastly simplified. Healthcare would stop being the "cash cow" for database companies, consulting companies, IT and integration companies. It might even make a dent in the ingrained practice of "off the record" perks vendors like to use to sway decisions in healthcare buying.

Medical practice

The effects of proposed changes on individual physicians cannot be overlooked if



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any system can be expected to work. Nowhere in our society are the documentation, sharing and analysis of data more critical than in the daily practice of medicine. Several thousands of electronic medical records systems have been deployed into healthcare setting with poor rates of acceptance. Built on relational databases and designed to have complex data entry screens, these applications must contend with webs of integrations to other applications.

Interface substructure software provides a critical functionality. The ISS becomes the main information hub for the user, brokering information back and forth between text inputs, data in the repository from other applications, other text documents and legacy sources. The key functionality, which is customizable to each user and institution, is the ISS and the unstructured search query. It eliminates redundancy and effort for the user and focuses the user's computer time on the most productive tasks.

Sharing lanes on the interstate communications expressway

An early response to the 9-11 terrorist attacks was the Bush Administration's proposal to build an "interstate communications expressway." To be patterned on the interstate highway system, the new system would expedite the exchange of homeland security-related information among federal, state, and local government units by linking existing networks. Washington would pay for "on and off ramps," but states would need to adhere to data standards and architecture to be able to use the system.

Though the idea of the e-interstate is to facilitate the exchange of data related to homeland security, why not use the same pathways for other types of information? Thus, without the capital outlay for a duplicative initiative, a national health network could be created.

¹ *What is Unstructured Information Management?* Unstruct.org website, April 1, 2003. Full text free here: <http://www.unstruct.org/?p=5>

-What's new in the literature?- Six Sigma health care initiatives

In the 18 years since the Six Sigma methodology was pioneered at Motorola, the company has achieved over \$17 billion in savings. Six Sigma is based on a statistical concept and refers to the reduction of defects to no more than 3.4 per million parts or opportunities. Six Sigma projects are dependent on objective analysis of data and are focused on results. Examples of Six Sigma initiatives at **Bay Medical Center** (Panama City, FL, 433 beds), **Northshore-LIJ Health System** (Great Neck, NY), **Health Insurance Plan of New York**, and **Blue Cross Blue Shield of Florida** are described in the *Healthcare Informatics* article. Hospitals do not need sophisticated information systems to begin to produce data useful for Six Sigma analyses.

Sources:

Motorola: *About Motorola University*.

Full text free here: <http://www.motorola.com/content/0,,3071-5801.00.html>

Statistical six sigma definition. *ISixSigma*.

Full text free here: <http://www.isixsigma.com/library/content/c010101a.asp>

Hagland M: Six Sigma practices. *Healthcare Informatics*, January 2006;23(1):pp 27+. Full text free here: http://www.healthcare-informatics.com/issues/2006/01_06/cover.htm

Lean management concepts

Health care organizations are experimenting with lean management concepts



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transferred from the manufacturing sector in order to improve processes and cut waste. Lean management can be used in conjunction with Six Sigma initiatives. The objective is to study processes and quantify the movement of people or equipment. As they become increasingly automated, hospital laboratories are good candidates for lean manufacturing or Six Sigma projects.

Sources:

Page L: Getting the skinny on lean management. *Materials Management in Health Care*, September 2005; 14(9):pp 26-29. Full text free here:

http://www.matmanmag.com/matmanmag/hospitalconnect/search/article.jsp?dcrpath=MATMANMAG/PubsNewsArticleGen/data/0509MMH_FEA_ProcessImprovement&domain=MATMANMAG

Haugh R: The Demand for more exacting test results – fast! – reformulates hospital labs. *H&HN*, January 2006; 80(1). Full text free here:

http://www.hhnmag.com/hhnmag/hospitalconnect/search/article.jsp?dcrpath=HHNMAG/PubsNewsArticle/data/0601HHN_FEA_ClinicalMgt&domain=HHNMAG

Co-development of oncology EMRs

Leading cancer centers like **Memorial Sloan Kettering** (New York) are working with IT vendors to co-develop or customize products to meet the complex needs of caring for oncology patients. Memorial Sloan Kettering has collaborated with **Eclipsys** to customize an electronic medical record particularly well suited for chemotherapy order entry that will debut commercially soon. Similarly, **Tennessee Oncology** (Nashville) has been working with **Allscripts** to customize an EMR.

Source: Hagland M: The Cancer care niche. *Healthcare Informatics*, January 2006; 23(1):p 38. Full text free here: http://www.healthcare-informatics.com/issues/2006/01_06/specialty.htm

Helping get the diagnosis right

Although not as frequently discussed as medication error, misdiagnosis is also a serious factor in patient safety. In a study of internists' patients, researchers found that both system-related and cognitive causes contributed to diagnostic errors. Diagnosis decision support systems offer assistance, but physicians have experienced barriers to using them. New versions, using *unstructured text*, help overcome these obstacles.

Sources:

Britto J: Misdiagnosis: the overlooked patient safety issue. *H&HN Most Wired Magazine*, November 11, 2005 online site. Full text free here:

http://www.hhnmostwired.com/hhnmostwired/jsp/articledisplay.jsp?dcrpath=HHNMOSTWIRED/PubsNewsArticleMostWired/data/060118MW_Online_Britto&domain=HHNMOSTWIRED

Graber ML, et al.: Diagnostic error in internal medicine. *Archives of Internal Medicine*, July 11, 2006; 165(13):pp 1493-1499.

Abstract free here: <http://archinte.ama-assn.org/cgi/content/abstract/165/13/1493>

Heart practice implements EMR

New York Heart Center (Syracuse), a group practice with about 20 physicians replaced transcription with an electronic medical record in 2004. Implementation of the new system took 2 months and eliminated nearly \$300,000 annually in transcription costs. All of the practice's physicians use the new system.

Source: McBride M: Out with the old, in with the new. *Health Management Technology*, January 2006; 27(1):pp 30+.

Full text free here: http://www.healthmgttech.com/archives/0106/0106out_old.htm

Storage area networks growing

Health care organizations are experiencing ballooning demand for data storage. The 3-hospital **Palmetto Health** (Columbia, SC) is currently at 70 terabytes and the 8-hospital **Carilion Health System** (Roanoke, VA) has 55 TBs, up from 7 TBs five years ago (1 terabyte = 1000 gigabytes = about 1 trillion bytes, although

definitions vary). The use of storage area networks (SANs) and virtualization strategies are discussed.

Sources:

Hagland M: More to store. *Healthcare Informatics*, January 2006; 23(1):pp 33+.

Full text free here: http://www.healthcare-informatics.com/issues/2006/01_06/hagland.htm

What is a terabyte? *The Math Forum [Drexel University]*, March 24, 2002.

Full text free here: <http://mathforum.org/library/drmath/view/54381.html>

Patient classification systems

Basic features of the patient classification software offered by eight manufacturers are compared in this buyers' guide. Each listing identifies whether the product is stand alone, who owns the data, level of involvement of caregivers in system design, and initial and ongoing pricing.

Source: Enrado P: Buyers guide: patient acuity/case mix management solutions. *Healthcare IT News*, January 2006.

Full text free here: <http://www.healthcareitnews.com/printStory.cms?id=4359>

Tracking supplies, staff and beds

Use of barcoding, radio frequency identification devices (RFID) and bed management software at three large providers is described in these stories. **Yale-New Haven Hospital** (CT, 944 licensed beds) is testing an RFID system to track equipment and managers in the surgical suite and a critical care unit. Patient tracking is expected to be added as well. **Sutter Health** (Sacramento, CA, 26 hospitals) intends to install bar-code scanning capabilities at every bedside to reduce medication errors. **University of Wisconsin Hospital** (Madison, 560 licensed beds) has implemented bed management tracking software including access from a hand-held device.

Sources: Rogoski RR: On track. *Health Management Technology*, January 2006; 27(1):pp 12+.

Full text free here: http://www.healthmgttech.com/archives/0106/0106on_track.htm

Y-NH installs tracking system. *Yale Daily*, September 27, 2005.

Full text free here:

<http://www.yaledailynews.com/articlefunctions/Printerfriendly.asp?AID=30039>

Sutter Health: Barcoding medications: making medication delivery even safer. *About Us*.

Full text free here: http://www.sutterhealth.org/about/patientsafety/ps_emap.html

Interoperability concept explained

Phone service illustrates interoperability at its best, in that any phone can call any other phone. Likewise, health care data could potentially become available to patients anywhere if computers were able to communicate efficiently. Activities of the National Alliance for Health Information Technology and the Office of the National Coordinator for Health Information Technology in moving the nation toward interoperability are reviewed in this cover story.

Source: Heubusch K: Interoperability: what it means, why it matters. *Journal of AHIMA*, January 2006; 77(1):pp 26-30.

Full text free here:

http://library.ahima.org/xpedio/groups/public/documents/ahima/pub_bok1_028957.html

Widespread interoperability soon?

While the concept of widespread data sharing between organizations is appealing, in reality nearly all of the benefit of health care IT will be within the health care organization in the near term, according to one observer. Among the potential clinical benefits of health care IT are the ability to monitor how well patients are complying with treatment, enhanced communication among doctors, clinical alerts, and reducing unnecessary utilization of tests and services. One of the issues in developing a national health information network will be getting full

participation in adopting the technology. Thirty-five percent is estimated to be the critical mass for participation of health care organizations in order to achieve a useful network.

Source: Jones L: Beyond data sharing: for physicians, optimism and caution over using networked patient data. *Journal of AHIMA*, January 2006; 77(1).

Full text free here:

http://library.ahima.org/xpedio/groups/public/documents/ahima/pub_bok1_028958.html

Thorny identity and privacy issues

Examples of the patient identity and privacy issues related to the formation of a regional health information organization (RHIO) are sketched out in the documents by Dr. Levis, medical director at **Sentillion**, a vendor of identity and access management solutions. A typical "life cycle" consisting of five basic interactions between a subject (either patient or provider) and a RHIO is described. The role of biometric authentication as a way of protecting sensitive information is explored in the McBride article. Fingerprint readers, palm vein scanners, and software that recognizes typing rhythms can be used to uniquely identify individuals.

Sources:

Levis J: Identity and access management: the starting point for a RHIO. *Health Management Technology*, January 2006; 27(1): pp 64+.

Full text free here: http://www.healthmgttech.com/archives/0106/0106thought_leaders.htm

Levis J, Jaffe C: *RHIOs/NHIN: Points to Consider*, July 21, 2005. Full text free here:

http://www.amdis.org/Levis_Jaffe2005.pdf

McBride M: What you know, what you are, what you have. *Health Management Technology*, December 2005; 26(12): pp 10+.

Full text free here: http://www.healthmgttech.com/archives/1205/1205what_you.htm

RHIO survey probes record linking

How regional health information organizations are tackling the problem of linking patient records is reviewed based on a survey of 21 RHIOs in this practice brief. The basic method involves comparing common identifiers like name and social security number using either exact or partial matching. At the intermediate level, weighting or fuzzy logic is added to the process. The most advanced methods add sophisticated tools such as probabilistic matching.

Source: Surveying the RHIO landscape. *Journal of AHIMA*, January 2006; 77(1): pp 64A-64D.

Full text free here: <http://library.ahima.org/intradoc->

http://library.ahima.org/intradoc-cgi/idc.cgi_isapi.dll?IdcService=GET_HIGHLIGHT_INFO&QueryText=xUse+%3cMatches%3e+%60Published%60+%3cAND%3e+%28xSource+%3csubstring%3e+%60AHIMA+Practice+Brief%60+%3cNOT%3e+xSource+%3csubstring%3e+%60AHIMA+Practice+Brief+attachment%60%29&SortField=xPubDate&SortOrder=Desc&dDocName=pub_bok1_028980&HighlightType=HtmlHighlight&dWebExtension=.html

Revenue cycle analytics save \$\$

Riverside Health System (Newport News, VA) significantly improved accounts receivable days and bad debt metrics for its 3-hospital acute care division by first attacking process bottlenecks and then participating in a revenue cycle performance program called Revenue Cycle Compass, sponsored by **The Advisory Board Company**. The Compass package, offered as a hosted applications model, was found to be simple to implement. Days in A/R were cut from 78 at the beginning of the improvement process to 43.5 at the time the article was written.

Source: Fleischer R: Healthy competition for data. *Health Management Technology*, November 2005; 26(11): pp 32-34.

Full text free here: [http://www.healthmgttech.com/cgi-](http://www.healthmgttech.com/cgi-bin/arttop.asp?Page=1105/1105healthy_competition.htm)

[bin/arttop.asp?Page=1105/1105healthy_competition.htm](http://www.healthmgttech.com/cgi-bin/arttop.asp?Page=1105/1105healthy_competition.htm)